FIFTH INTERIM REPORT

OF THE

PLANNING SUBCOMMITTEE

OF THE

FCC ADVISORY COMMITTEE

ON

ADVANCED TELEVISION SERVICE

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EXECUTIVE SUMMARY

This is the fifth interim report of the Planning Subcommittee of the FCC's Advisory Committee on Advanced Television Service. This report covers work performed by the Planning Subcommittee between February 1991 and February 1992.

Most of the tasks set for the Planning Subcommittee in this fifth period of work have been completed or are well advanced. It is appropriate at the outset of this report to recognize and appreciate the hard work and contributions of the many individuals and companies who have made this possible.

Progress Summary

Working Party 1 (PS WP-1, Technology Attributes and Assessment), and Working Party 2 (PS WP-2, Testing and Evaluation Specifications), have completed their work and have been inactive during the period. The results of their previous work are being applied in the ATTC test program.

Working Party 3 (PS WP-3, Spectrum Utilization and Alternatives) has developed a set of principles which are being used to determine the actual factors to be applied in calculating the performance to be expected from each of the proponent systems. The objective of this work is to generate a typical table of spectrum allotments and a table of specific ATV channel assignments for each of the existing

NTSC stations in the U.S. The Planning factors which are ATV system-independent have been completed. Those which are dependent on the characteristics of each proponent ATV system can only be developed when the ATTC test data on the various ATV proponent systems have been reported and processed. These planning factors will thus be developed following the completion of testing of each proponent system.

PS WP-3 has also completed a comprehensive study of the means to provide each ATV transmitter with the necessary Broadcast Auxiliary Services (BAS). These include the means for delivering the ATV signal from its point of origination in the studio to the transmitter. The results of this study indicate that, in major metropolitan markets, the spectrum now designated for BAS is extremely congested to the point where the unavailability of BAS frequency could jeopardize the timely introduction of an ATV service. Possible solutions to this problem have been investigated, and are more fully addressed in a report, "Broadcast Support Spectrum", appended to the WP-3 Chairman's Report in Section VII C. (page 28).

In efforts to initiate negotiations on spectrum allotments for ATV service in cross-border areas, the FCC has written to and has had discussions with the Mexican authorities. WP-3 has written to the Canadian authorities, and has received an encouraging response in November, 1991 from the Chairman of the Joint Technical

Committee on Advanced Broadcasting.

Working Party 4 (PS WP-4, Alternative Media Technology and Broadcast Interface), having completed its initial assignments, was inactive during much of the period. However, on September 16, 1991, PS WP-4 was asked by the Chairman of the Advisory Committee to direct a review of "interoperability" and "extensibility" with regard to advanced video systems. This work recognizes the fact that ATV service is but one application of High Definition technology, and that in the future it will be desirable that ATV systems be interoperable with and extensible to other applications. PS WP-4 has already made a start in defining the possible paths of technical evolution for HDTV systems, paths which will assure increased openness among different applications. In this work, it has been determined that one of the fundamental requirements in the future for achieving interoperability, extensibility, and scalability, is the inclusion of headers and descriptors as part of the digital data stream to fully identify the image.

Working Party 5 (PS WP-5, Economic Factors and Market Penetration) worked closely with Systems Subcommittee Working Party 3 during the period, examining the implications of the transition scenario for local broadcasters which PS WP-5 had previously developed.

PS WP-5 has reexamined the assumptions on which the earlier

projections of the rate of penetration of ATV in the consumer market had been based. Some of these assumptions have been found to be untenable in the light of recent technological advances and regulatory proposals, and work is proceeding on a revised set of projections.

In response to an earlier assignment, PS WP-5 has investigated the impact of ATV policies on industrial development and international trade, and a paper entitled: "Impact of ATV Policies on U.S. Manufacturing and International Trade", was submitted to the Chairman of the Advisory Committee on September 25, 1991. The paper is attached to the PS WP-5 report (Appendix E).

Working Party 6 (PS WP-6, Subjective Assessment) completed all its assigned work on the preparation of test materials, and was engaged during the period in certifying the expert viewers for the tests of proponent systems being conducted at the ATTC.

In July, 1991, PS WP-6 was asked by proponents to supply a one-hour test program for use in the field tests. WP-6 agreed to do this, but, since the material must be made in a specific format, preparation of the test material will not start until the system or systems qualifying for the field tests have been identified.

The Advisory Group 1 (PS AG-1, Creative Issues) and Advisory Group 2 (PS AG-2, Consumer and Trade Issues) have been inactive during the period, and PS AG-2 has been disbanded. As reported in the fourth interim report, PS WP-7 (Audience Research) has also been disbanded.

The Chairman of the Advisory Committee requested the Chairman of the Planning Subcommittee to monitor the emergence of any additional ATV system proposals other than those currently certified for testing.

The Chairman of the Planning Subcommittee requested Renville McMann, Chairman of PS WP-1, to survey and monitor the field, and to submit a report by the end of the first quarter of 1992. This has been done, and the report is presented in Section VIII.

As of today, no additional ATV systems are candidates for consideration in the current FCC ACATS ATV certification and test schedule.

Further Work

The primary remaining tasks for the next period of work are the completion of the ongoing work of PS WP-3, leading to a table of spectrum allotments and assignments of ATV channels for each NTSC station. As soon as reports on the results of the proponent tests are received, reports on ATV coverage and accommodation statistics will

be prepared system-by-system, using the planning factors prepared and the interference/coverage computer program now being developed by the Broadcasters' Caucus.

PS WP-4 will continue its investigation and study of the requirements for a system of headers and descriptors for all image data. The Working Party will further examine the means by which ATV systems might be made more interoperable, extensible, and scalable with alternative media and applications, including scalable standards.

PS WP-5 will continue to acquire better consumer cost data, and complete a revised projection of the rate of ATV service penetration in the consumer market. PS WP-5 will also develop a new transition scenario to ATV service for local TV stations in the light of the strictures implied by the FCC's second Notice of Proposed Rule-making on ATV service, and the development of new cost data for interim and final ATV equipment.

PS WP-5 will also cooperate with SS WP-3 to obtain detailed information from ATV proponents on decoder costs, to prepare a cost and complexity comparison for submission to SS WP-4.

PS WP-6 will develop the long-form test material requested by proponents for use in the field tests.

From the above summary account, it is seen that the work of the Planning Subcommittee is essentially complete except for the remaining tasks assigned to Working Parties 3, 4, and 5.

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I. INTRODUCTION

This is the fifth interim report of the Planning Subcommittee of the FCC's Advisory Committee on Advanced Television Service. The report summarizes the volume of work done by members of the Subcommittee during the fifth period from February, 1991 to February, 1992. A fuller accounting of this work is reflected in the many documents submitted to the Working Parties and in the reports of the Working Party Chairmen appended hereto in Appendices B through F. The energy and dedication of all participants is gratefully acknowledged.

In addition to outlining the tasks set the Working Parties and the results achieved, this report presents an overview of the work assigned to the Working Parties for the next semester.

The Report is organized as follows. Section II presents a brief summary of previous Subcommittee work. Section III outlines the assignments to each Working Party for the fifth period, while Section IV details the progress made by the Working Parties in the fifth period. Section V outlines the remaining work of the Planning Subcommittee, while Section VI presents the conclusions of the work, and offers recommendations to the Advisory Committee.

Section VII contains each Working Party Chairman's Executive Summary for the fifth period.

Section VIII contains a report on the status of proposed systems and techniques other than those currently certified for testing. This report was requested by the Chairman of the Advisory Committee.

II. BACKGROUND.

The accomplishments of the Planning Subcommittee in the previous fourth period of work (January, 1990 to January, 1991) were reported fully in the Fourth Interim Report. In brief, they may be summarized as follows:

-Working Parties 1 and 2 made a number of refinements to the list of attributes. It was determined that only unenhanced and normalized video materials should be used for testing. It was also determined that more than one site should be used for field testing.

- Working Party 3 began an examination of the capacity of the Broadcast Auxiliary Services Spectrum to accommodate the needs of ATV service. The relationship between ATV channel availability and receiver taboos under various scenarios was studied. It was discovered that the greatest number of existing stations could be assigned an ATV channel if ATV and NTSC facilities were co-located.

- Working Party 4, having developed the concept of the Multiport receiver, monitored the standards planning work which is being conducted by the EIA .

- Working Party 5 refined the the original receiver penetration estimates, and appraised the cost to local broadcast stations of transitioning to a simulcast ATV service.

- Working Party 6 concentrated on the production of the high definition and NTSC videotaped test materials needed for the Advisory Committee's test plan.

III. NEW ASSIGNMENTS TO WORKING PARTIES FOR THE PERIOD FEBRUARY 1991 TO FEBRUARY 1992

At a meeting of the Planning Subcommittee Steering Committee on 6th. March, 1991, new work assignments were developed for the Working Parties. These are summarized below.

A. Working Party 1: Technology Attributes and Assessment, and Working Party 2: Testing Evaluation and Specifications

While the main work of these two Working Parties was complete, they were requested to remain constituted in case any changes in attributes or test specifications were required. Because of the changes being made by proponents towards all-digital technology, the Chairmen were asked to stay abreast of developments in the objective testing program.

B. Working Party 3: Spectrum Utilization and Alternatives

Working Party 3 was asked to concentrate on three critical tasks. First, WP-3 was to prepare for and conduct comparative evaluation of the coverage and interference characteristics of each proponent system. In this regard, certain properties of a preferred system had already been articulated, including those which would allow for the assignment to virtually all existing NTSC TV stations (but excluding

low power stations), of an additional 6 MHz ATV channel with coverage essentially equivalent to NTSC interference free Grade B contour. The Working Party undertook to propose such a channel assignment for ATV systems. The spectrum evaluations were to include an assessment of how well each proponent system met this objective. In working toward this objective, each system's planning factors were to be finalized, and a computerized model developed for rating and presenting a comparative analysis.

Second, WP-3 was to conclude its study of broadcast distribution and contribution circuit requirements and options. From this work, recommendations for consideration by the Advisory Committee were to be developed.

Third, WP-3 was to continue its efforts to assist the FCC in achieving coordination of ATV spectrum usage with Canada and Mexico.

C. Working Party 4: Alternative Media Technology and Broadcast Interface

WP-4 completed its initial work of ensuring that the Advisory Committee's test plan adequately assesses how well terrestrial ATV systems interface with cable media, and that proponents be informed of the special requirements of the alternative media.

On September 16, 1991, The Chairman of the Advisory Committee announced the appointment of Dr. Robert L. Sanderson of Eastman Kodak Company as a new Vice Chairman of PS WP-4, to direct a review of "interoperability" and "extensibility" with regard to advanced video systems, under the leadership of the Chairman of WP-4, Edward Horowitz of Viacom International. A new Specialist Group was formed for this work. The Chairman of the Advisory Committee stressed that the review be conducted within the established timetable of the Advisory Committee.

WP-4 was also asked to define a number of terms, including interoperability, scalability, and extensibility, characteristics essential to the emerging technological confluence of broadcasting, computers, cable, and telecommunications generally.
Further, WP-4 was to study the value of headers and descriptors as part of the digital data stream in order to fully identify the data stream, and provide a gateway to effective interoperability.

D. Working Party 5: Economic Factors and Market Penetration

In March, 1991, the Chairman of WP-5, Michael Tyler was obliged to tender his resignation following his relocation to Europe. The Chairman of the Advisory Committee then appointed Rupert L. Stow to be Chairman of WP-5.

Working Party 5 was required to continue its macro-economic analysis as new factual data became available to refine and update projections of the costs and the penetration of ATV equipment in consumers' homes.

The Working Party was also required to investigate the implications of ATV policies for industrial development and international trade.

E. Working Party 6: Subjective Assessment

The Working Party was required to complete the preparation of subjective test materials by producing the film transfers and the electronically generated video test material, thus completing its primary assignment.

It was further required to generate, maintain, and manage the roster of "expert viewers" required for the viewing panels that were to evaluate some of the system tests. We should note here that the burden of coordination and administration of the expert viewers fell on the staff of the ATTC, who have done an exceptional job in providing expert viewers throughout the testing program thus far.

IV . PROGRESS REPORT OF THE PLANNING SUBCOMMITTEE

The Planning Subcommittee addressed all the matters described above, and made significant progress towards all its objectives. This section summarizes the specific progress made by the various working parties in the period February, 1991 to February, 1992.

A. Progress Report of Working Party 1: Technology Attributes and Assessment, and Working Party 2: ATV Testing and Evaluation Specifications

These Working Parties have been inactive during the work period, and no formal meetings have been held. However, the Chairmen and some members of the Working Parties have followed closely the testing of the proponent systems, and have attended meetings of SS WP-1 and SS WP-2 in order to clarify any questions which might arise from the interpretation of the Technical Attributes List originally prepared by PS WP-1.

B. Progress Report of Working Party 3: Spectrum Utilization and Alternatives

To carry out the multi-faceted program of work assigned, WP-3 has continued with an organization of Specialist Groups, each

concentrating on a specific area, and described in previous reports. During the fifth period of work, advances in three main areas are reported, as detailed below.

1. Spectrum analysis.

WP-3 was charged to investigate the alternatives for providing accommodation for ATV systems within the existing VHF and UHF spectrum allocations. A set of Planning Principles has been developed to guide the development of spectrum allocations for ATV service. These Principles are used to develop actual planning factors, and those factors which are independent of the characteristics of the proponent systems have been completed. The remaining factors that are dependent on the performance of individual proponent systems, cannot be developed until the results of the on-going test program conducted by the ATTC are complete, and the data has been reduced by the ATEL group in Canada. It is expected that the interference characteristics will vary from system-to-system, and thus the system-dependent planning factors will be different for each proponent system.

The recommendations of WP-3 in this area are presented in the WP-3 Chairman's Report in Section VII C.

During the period, a new Specialist group was formed with the mandate to develop a methodology and a supporting computer model for evaluating the coverage and interference characteristics of

proposed ATV transmission systems. A methodology has been developed for:

1) Evaluating limits on the minimum separation distances, maximum antenna heights, and maximum permissible powers of ATV transmitters;
2) Calculating the noise-limited service areas of ATV stations, and
3) Calculating the interference-limited service areas of ATV and NTSC stations.

The purpose of the computer model is to calculate and plot service and interference contours quantitatively, using a visual display for:

1) The evaluation of ATTC interference and coverage test data,
2) The comparison of the interference and coverage provided by proponent transmission systems, and the evaluation of proposed channel allotment plans.

As a result of its work in this area, PS WP-3 recommended that ATTC/ATEL perform subjective evaluations of NTSC-into-NTSC co-channel interference, including the 28 dB condition, as a basis for determining the level of ATV system co-channel interference that is subjectively equivalent to any given level of NTSC co-channel interference. ATTC is planning to do this evaluation.

The time table for the completion of this work is based on the following projections. The computer software program for coverage and interference, which is being developed by the Broadcasters' Caucus, will be complete by March, 1992.

Test information from the NHK, GI, and Zenith/AT&T systems should be available for analysis by May,1992 Some preliminary results on the first systems should be available by June,1992.

If it is necessary that all systems be individually evaluated, completion could not occur until September,1992. However, if comparable coverage and 100 percent allotment/assignment are demonstrated with the early proponent tests, it may not be necessary to complete all the proponent tests before an allotment and assignment plan can be recommended .

The pacing item in the above schedule is the timely preparation of the data by the ATTC and ATEL required for analysis in the coverage/interference computer program.

2. Broadcast Auxiliary Services.

The Commission's Notice of Proposed Rule-making of October 24, 1991, presented a tentative decision that no additional spectrum would be made available for broadcast auxiliary use, based upon the assumption that advantage can be taken of digital compression technology and fiber optic links.

WP-3 has studied the problem in depth, and its conclusions are presented in the WP-3 Chairman's Report in Section VII C.

While better frequency coordination in the BAS spectrum and the introduction of fiber optic cable where feasible will help the situation, WP-3 sees the need for additional BAS spectrum to be crucial for the implementation of ATV service. This matter is expanded in more detail in a separate report submitted to the Chairman of the Advisory Committee, and appended to the WP-3 Chairman's Report in Section VII C. This report contains specific recommendations to resolve this crucial problem.

3. Cross-border spectrum allotments

The cross-border spectrum allotments for Canada and Mexico have been investigated by the FCC during the work period, and some progress has occurred. In response to a letter from WP-3 to the Canadian authorities, a reply was received in November, 1991 from the Chairman of the Joint Technical Commission on Advanced Broadcasting. He asserted that ATV allotment plans for Canada and the U.S. will be fully integrated within coordination zones now defined in the Canada/U.S.A. television agreement.

During the period, The FCC has held personal discussions with Mexican officials, who have been invited to participate in the work of planning spectral allotments.

C Progress Report of Working Party 4: Alternative Media Technology and Broadcast Interface

In September, 1991, WP-4 was reconstituted to address the new task of studying "interoperability", "extensibilty", and "scalability" with regard to advanced video systems, within the present time schedule established by the ACATS.

WP-4 was asked to consider how future improvements and applications of high resolution video systems might be most effectively accommodated, particularly recognizing advances in computing and communications technology.

WP-4 has actively addressed these issues with participation by computing, telecommunications, imaging, broadcasting, and consumer electronics industry experts. Definitions, architecture, alternative media and applications, and the value of interoperability, extensibility, scalability, and more generally, openness, have been considered.

Definitions have been prepared for a number of terms including interoperability, extensibility, and scalability. These characteristics are important for devices and systems that can provide the user with the ability to interface with a number of different video signal sources, each of which may have quite different formats and quality levels.

A common understanding of these terms is essential and a first set of definitions is presented as an addendum to the WP-4 Chairman's Report in Section VII D.

WP-4, noting that most of the ATV proponent systems now under evaluation are digital systems, recognizes that digital processing and transmission may enable ATV systems to be interoperable with, and scalable to, other formats for presentation or transmission.

In the future, multiple digital video signal standards will exist for a variety of applications, and these signals will be transmitted over different media with dissimilar characteristics. When this occurs, it becomes important to label the image data to identify the structure and the contents of the data being transmitted. From a study of these basic concepts, it has been determined that it will be important to include "headers" and "descriptors" within the image data stream to fully identify the image content and its structure. This will allow a terrestrial broadcast standard to be established on schedule, and will provide a basic degree of interoperability among alternative and future systems. Headers and descriptors are necessary to assure future opportunities. The detailed characteristics of a particular system determine its full degree of interoperability, extensibility, and scalability.

The Society of Motion Picture and Television Engineers (SMPTE) is working on a recommendation for these headers and descriptors, and PS WP-4 has established a liaison to maintain close contact with this work.

A new Specialist Group was formed by the Chairman of WP-4 on February 6, 1992, to study the performance of ATV signals when transmitted by satellite. It was determined that the time, facilities, or funding were not available to conduct a physical comparative test program for each proponent system.

Accordingly, and as an alternative procedure, the Specialist Group has been tasked to define the satellite environment as it will exist in 1993, and to establish the minimum performance criteria necessary for the transmission of an ATV signal. Proponents will be given a list of the parameters required for satellite transmission, and asked to predict how well their ATV system will perform in this modelled transmission scenario.

A progress report on the work to date is appended to the WP-4 Chairman's Report in Section VII D.